CLAIMS

What is claimed is:

SUB A1

1. A method for generating additional information for guaranteeing seamless playback, the method comprising a step of generating data stream information for each of two or more data streams comprising packet data to which information on an arrival time of the respective packet data is added, the data stream information comprising seamless playback information, which indicates whether a corresponding data stream is to be seamlessly reproduced after playback of a preceding data stream, and/or seamless time control information for controlling an output time of the corresponding data stream to be seamlessly reproduced.

2. The method of claim 1, wherein the seamless time control information comprises a reference time, offset information and/or gap length information.

3. The method of claim 2, wherein the reference time is obtained based on arrival times of packet data of the preceding data stream and indicates an output time of a first packet data of the corresponding data stream to be seamlessly reproduced.

4. The method of claim 2, wherein the offset information is obtained based on arrival times of packet data of the preceding data stream and is a value of the difference between an original arrival time of a first packet of the corresponding data stream to be seamlessly reproduced and the output time of the first packet of the corresponding data stream.

5. The method of claim 2, wherein the gap length information is a value of an amount of time from an output time of a last packet of the preceding data stream to a time at which a first packet of the corresponding data stream to be seamlessly reproduced must be output.

6. The method of claim 1, wherein the seamless time control information is valid only when the seamless information has a value indicating "seamless playback."

SUB A2

7. The method of claim 1, wherein each of the data streams comprises a plurality of packs, each pack which comprises the predetermined number of packet data to which information on the arrival time of the respective packet data is added, and an extra header which is added to the packet data with arrival time information.

8. A recording medium comprising:

a first area including a plurality of data streams composed of packet data to which information on the arrival time of the respective packet data is added; and

a second area including data stream information comprising seamless information, which indicates whether a corresponding data stream is to be seamlessly reproduced after playback of a preceding data stream, and/or seamless time control information for controlling an output time of the corresponding data stream to be seamlessly reproduced.

9. The recording medium of claim 8, wherein the seamless time control information comprises a reference time, offset information and/or gap length information.

10. The recording medium of claim 9, wherein the reference time is obtained based on arrival times of packet data of the preceding data stream and indicates an output time of a first packet data of the corresponding data stream to be seamlessly reproduced.

11. The recording medium of claim 9, wherein the offset information is obtained based on arrival times of packet data of the preceding data stream and is a value of the difference between an original arrival time of a first packet of the corresponding data stream to be seamlessly reproduced and the output time of the first packet of the corresponding data stream.

12. The recording medium of claim 9, wherein the gap length information is a value of an amount of time from an output time of a last packet of the preceding data stream to a time at which a first packet of the corresponding data stream to be seamlessly reproduced must be output.

13. The recording medium of claim 8, wherein the seamless time control information is valid only when the seamless information has a value indicating "seamless playback."

SUB #3

14. The recording medium of claim 8, wherein each of the data streams in the first area comprises a plurality of packs, each pack which comprises the predetermined number of packet data to which information on the arrival time of the respective packet data is added, and an extra header which is added to the packet data with arrival time information.

15. A recording apparatus comprising:

an arrival time information generator for adding arrival time information on an arrival time of input packet data to each input packet data;

a data stream information generator for generating data stream information for each of two or more data streams comprising the packet data to which the arrival time information of the respective packet data is added, the data stream information comprising seamless playback information, which indicates whether a corresponding data stream to be seamlessly reproduced after playback of a preceding data stream, and/or seamless time control information for controlling an output time of the corresponding data stream to be seamlessly reproduced; and

a recording controller for performing control such that the data stream is recorded in a first area of a recording medium and the data stream information is recorded in a second area of the recording medium.

16. The recording apparatus of claim 15, wherein each of the data streams in the first area comprises a plurality of packs, each pack which comprises the predetermined number of packet data to which information on the arrival time of the respective packet data is added, and an extra header which is added to the packet data with arrival time information.

17. The recording apparatus of claim 15, further comprising a counter which is driven by a system clock signal and reset at the moment when a first packet of each data stream is input, for performing counting operation and providing a count value to the arrival time information generator.

18. The recording apparatus of claim 15, wherein the seamless time control information comprises a reference time, offset information and/or gap length information.

19. The recording apparatus of claim 18, wherein the reference time is obtained based on arrival times of packet data of the preceding data stream and indicates an output time of a first packet data of the corresponding data stream to be seamlessly reproduced.

20. The recording apparatus of claim 18, wherein the offset information is obtained based on arrival times of packet data of the preceding data stream and is a value of the difference between an original arrival time of a first packet of the corresponding data stream to be seamlessly reproduced and the output time of the first packet of the corresponding data stream.

21. The recording apparatus of claim 18, wherein the gap length information is a value of an amount of time from an output time of a last packet of the preceding data stream to a time at which a first packet of the corresponding data stream to be seamlessly reproduced must be output.

22. The recording apparatus of claim 18, wherein the seamless time control information is valid only when the seamless information has a value indicating "seamless playback."

SUB A4

23. An editing apparatus for editing data recorded in a recording medium comprising a first area including a plurality of data streams composed of packet data to which information on the arrival time of the respective packet data is added, and a second area including data stream information comprising seamless information, which indicates whether a corresponding data stream is to be seamlessly reproduced after playback of a preceding data stream, and/or seamless time control information for controlling an output time of the corresponding data stream to be seamlessly reproduced, the editing apparatus comprising:

a data information updator for, after editing by the editing apparatus, analyzing the data stream information and updating the seamless time control information so that data at either side of the boundary between data streams, at which seamless playback is not guaranteed, can be seamlessly played back; and

an editing controller for performing control such that edited data streams are recorded in a first area of the recording medium and updated data stream information is recorded in a second area of the recording medium.

24. The editing apparatus of claim 23, wherein the seamless time control information comprises a reference time, offset information and/or gap length information.

25. The editing apparatus of claim 24, wherein the reference time is obtained based on arrival times of packet data of the preceding data stream and indicates an output time of a first packet data of the corresponding data stream to be seamlessly reproduced.

26. The editing apparatus of claim 24, wherein the offset information is obtained based on arrival times of packet data of the preceding data stream and is a value of the difference between an original arrival time of a first packet of the corresponding data stream to be seamlessly reproduced and the output time of the first packet of the corresponding data stream.

27. The editing apparatus of claim 24, wherein the gap length information is a value of an amount of time from an output time of a last packet of the preceding data stream to a time at which a first packet of the corresponding data stream to be seamlessly reproduced must be output.

28. The editing apparatus of claim 23, wherein each of the data streams in the first area comprises a plurality of packs, each pack which comprises the predetermined number of packet data to which information on the arrival time of the respective packet data is added, and an extra header which is added to the packet data with arrival time information.

29. A playback apparatus for reproducing data recorded in a recording medium comprising a first area including a plurality of data streams composed of packet data to which information on the arrival time of the respective packet data is added; and a second area including data stream information comprising seamless information, which indicates whether a corresponding data stream is to be seamlessly reproduced after playback of a preceding data stream, and/or seamless time control information for controlling an output time of the corresponding data stream to be seamlessly reproduced, the playback apparatus comprising:

a playback controller for reproducing the data streams and data stream information which are recorded in the recording medium;

a counter which is driven by a system clock signal and reset according to arrival time information which has been added to a packet that is first reproduced by the playback controller;

a first processor for modifying original arrival time information of a corresponding data stream to be seamlessly reproduced so as to provide modified arrival time information or for providing a control signal indicating a time when the counter is to be reset, based on data stream information provided from the playback controller; and

a second processor for controlling output by removing the original arrival time information which is added to the packet data in the corresponding data stream, which is provided from the playback controller, in response to an output of the first processor.

30. The playback apparatus of claim 29, wherein, when reproducing the corresponding data stream to be seamlessly reproduced without reset of the counter, the second processor controls output by removing the original arrival time information when the modified arrival time information is identical to the original arrival time information which has been added to the packet data, and, when reproducing the corresponding data stream to be seamlessly reproduced with reset of the counter, the second processor controls output by resetting the counter to a value of the arrival time information of a first packet data of the corresponding data stream in response to the control signal and removing the original arrival time information when the output of the counter is identical to the original arrival time information which is added to the packet data.

31. The playback apparatus of claim 29, wherein each of the data streams in the first area comprises a plurality of packs, each pack which comprises the predetermined number of packet data to which information on the arrival time of the respective packet data is added, and an extra header which is added to the packet data with arrival time information.

32. The playback apparatus of claim 29, wherein the seamless time control information comprises a reference time, offset information and/or gap length information.

33. The playback apparatus of claim 32, wherein the first processor converts the original arrival time information of the first packet data of the corresponding data stream into the reference time and adds a value of the offset information to values of the original arrival time information of the rest packet data of the corresponding data stream to provide the modified arrival time information.

34. The playback apparatus of claim 32, wherein the first processor adds a value of the offset information to a value of the arrival time information of a first packet of the corresponding data stream and, thereafter, adds the value of the offset information to values of the original arrival time information of the other packet data of the corresponding data stream to provide the modified arrival time information.

35. The playback apparatus of claim 32, wherein the first processor adds a value of the gap length information to a value of the original arrival time information of a last packet data of the preceding data stream to provide the control signal indicating the time when the counter is to be reset.

SUB A1

36. The playback apparatus of claim 32, wherein the second processor ignores the referent time, offset information and/or gap length information and outputs the data stream recorded in the first area of the recording medium based on the original arrival time information, when the seamless information has a value indicating "non-seamless playback."

37. A recording and playback apparatus comprising:

an arrival time information generator for adding arrival time information on an arrival time of input packet data to each input packet data;

a data stream information generator for generating data stream information for each of two or more data streams comprising the packet data to which the arrival time information of the respective packet data is added, the data stream information comprising seamless playback information, which indicates whether a corresponding data stream to be seamlessly reproduced

after playback of a preceding data stream, and/or seamless time control information for controlling an output time of the corresponding data stream to be seamlessly reproduced;

a recording controller for performing control such that the data stream is recorded in a first area of a recording medium and the data stream information is recorded in a second area of the recording medium;

a playback controller for reproducing the data streams and data stream information which are recorded in the recording medium;

a counter which is driven by a system clock signal, the counter being reset at the moment when each data stream is input and performing counting operation to provide a count value to the arrival time information generator, during recording, the counter being reset according to arrival time information which is added to a packet which is first reproduced by the playback controller, during playback;

a first processor for modifying original arrival time information of a corresponding data stream to be seamlessly reproduced so as to provide modified arrival time information or for providing a control signal indicating a time when the counter is to be reset, based on data stream information provided from the playback controller; and

a second processor for controlling output by removing the original arrival time information which is added to the packet data in the corresponding data stream, which is provided from the playback controller, in response to an output of the first processor.

38. The recording and playback apparatus of claim 37, wherein, when reproducing the corresponding data stream to be seamlessly reproduced without reset of the counter, the second processor controls output by removing the original arrival time information when the modified arrival time information is identical to the original arrival time information which has been added to the packet data, and, when reproducing the corresponding data stream to be seamlessly reproduced with reset of the counter, the second processor controls output by resetting the counter to a value of the arrival time information of a first packet data of the corresponding data stream in response to the control signal and removing the original arrival

time information when the output of the counter is identical to the original arrival time information which is added to the packet data.

39. The recording and playback apparatus of claim 37, wherein each of the data streams in the first area comprises a plurality of packs, each pack which comprises the predetermined number of packet data to which information on the arrival time of the respective packet data is added, and an extra header which is added to the packet data with arrival time information.

40. The recording and playback apparatus of claim 37, wherein the seamless time control information is valid only when the seamless information has a value indicating "seamless playback."

SUB A7

41. The recording and playback apparatus of claim 37, wherein the seamless time control information comprises a reference time, offset information and/or gap length information.

42. The recording and playback apparatus of claim 41, wherein the reference time is obtained based on arrival times of packet data of the preceding data stream and indicates an output time of a first packet data of the corresponding data stream to be seamlessly reproduced.

43. The recording and playback apparatus of claim 41, wherein the offset information is obtained based on arrival times of packet data of the preceding data stream and is a value of the difference between an original arrival time of a first packet of the corresponding data stream to be seamlessly reproduced and the output time of the first packet of the corresponding data stream.

44. The recording and playback apparatus of claim 41, wherein the gap length information is a value of an amount of time from an output time of a last packet of the preceding data stream to a time at which a first packet of the corresponding data stream to be seamlessly reproduced must be output.

45. The recording and playback apparatus of claim 41, wherein the first processor converts the original arrival time information of the first packet data of the corresponding data stream into the reference time and adds a value of the offset information to values of the original arrival time information of the rest packet data of the corresponding data stream to provide the modified arrival time information.

46. The recording and playback apparatus of claim 41, wherein the first processor adds a value of the offset information to a value of the arrival time information of a first packet of the corresponding data stream and, thereafter, adds the value of the offset information to values of the original arrival time information of the other packet data of the corresponding data stream to provide the modified arrival time information.

47. The recording and playback apparatus of claim 41, wherein the first processor adds a value of the gap length information to a value of the original arrival time information of a last packet data of the preceding data stream to provide the control signal indicating the time when the counter is to be reset.

48. The recording and playback apparatus of claim 41, wherein the second processor ignores the referent time, offset information and/or gap length information and outputs the data stream recorded in the first area of the recording medium based on the original arrival time information, when the seamless information has a value indicating "non-seamless playback."

add A9